BelAm Study of Thyroid Cancer and Other Thyroid Diseases in Belarus
Following the Chornobyl Accident

Progress Report for Quarter Beginning 01/07/2000 and Ending 30/09/2000

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Executive Summary

During the 3-rd quarter the contract was signed between Belarusian Red Cross and National Cancer Institute. Under this contract money will be transferred to The Red Cross and then to the Republican Dispensary of Radiation Medicine for the local purchase of specified goods and distribution to screened individuals.

All paperwork necessary for the contract with ISTC (Moscow) has been completed.

A collaborative meeting with US specialists and Ukrainian colleagues was conducted. The meeting was dedicated to diagnostics of thyroid diseases, modernization of the operational manual and study forms.

The work is continuing on invitation of cohort subjects and their screening. 823 subjects have been examined for the quarter.

Problems encountered during the quarter:

1. Subjects showing up at the screening. About 26 % from all invited subjects show up at the screening. To increase this figure it is necessary to stimulate the subjects. We perform exclamatory activity among them.
2. Irregular reagents delivery for the Central Laboratory. We communicate with NCI, Columbia University in order to improve the situation.
3. Expenditures delivered does not correspond to the order (vacutainers are of smaller size 5 ml in stead of 10 ml). A number of items ordered for 2000 have not been delivered.

Table 1. Results of Contacts with Subject for Screening Cycle 1 (Baseline Examination Only)

	Selection I (Record Selected = 19735)			Selection II (Record Selected = 19453)			Total (Record Selected = 39188)		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Duplicate Record Found	348		10	115		10	463		20
Total Subjects	19387	100.0	-10	19338	100.0	-10	38725	100.0	-20
Address Found	12877	66.42	320	10065	52.05	653	22942	59.24	973
Emigrated to Another Country	342	1.76	0	73	0.38	0	415	1.07	0
Deceased	56	0.29	0	40	0.21	0	96	0.25	0
Not Found	6111	31.52	-330	9156	47.35	-664	15267	39.42	-994
Ineligible	1	0.01	0	4	0.02	1	5	0.01	1

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report
Selection I - the first 19735 subjects who were originally selected from the dose files
Selection II - the remaining subjects in the dose files who were selected at the end of 1999
Address Found - a current address has been found using at least one of the tracing sources
Not Found - a current address or vital status was unknown by all of the tracing sources
Ineligible - subjects age at time of accident was determined to be out of the range

Table 2.   Results of Contacts with Subjects for Screening Cycle 1 (Baseline Screening Examination Only**)

	Selection I (Records Selected = 19735)			Selection II (Records Selected = 19453)			Total (# of Records = 39188)		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Address Found	12877	■	320	10065	■	653	22942	■	973
Invitation Sent	20055	■	1044	12519	■	2628	32574	■	3672
First Invitation	12593	100.0	328	8900	100.0	935	21493	100.0	1263
Accepted	3559	28.26	39	2863	32.17	95	6422	29.88	134
Refused	23	0.18	0	15	0.17	0	38	0.18	0
Did Not Respond	7454	59.19	239	5050	56.74	520	12504	58.18	759
Incorrect Address	939	7.46	28	387	4.35	68	1326	6.17	96
Temporarily Absent	497	3.95	5	226	2.54	20	723	3.36	25
Outstanding	1	0.01	1	206	2.31	203	207	0.96	204
Other	120	0.95	16	153	1.72	29	273	1.27	45
Subsequent Invitation	7462	100.0	716	3619	100.0	1693	11081	100.0	2409
Accepted	2483	33.28	36	330	9.12	139	2813	25.39	175
Refused	7	0.09	-1	7	0.19	5	14	0.13	4
Did not respond	3050	40.87	-132	2435	67.28	806	5485	49.50	674
Incorrect address	709	9.50	104	288	7.96	215	997	9.00	319
Temporarily Absent	81	1.09	-36	53	1.46	44	134	1.21	8
Outstanding	572	7.67	572	292	8.07	292	864	7.80	864
Other	560	7.50	173	214	5.91	192	774	6.98	365

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Selection I - the first 19735 subjects who were selected from the dose files

Selection II - the remaining subjects in the dose files who were selected at the end of 1999

Temporarily Absent - subject is in the military, prison, school, hospital, or on vacation and is temporarily away from his/her permanent address

Subsequent Invitation - an invitation was previously sent to a subject and they refused, didn't respond, or the address was incorrect; a second or subsequent invitation was sent, possibly with additional information or corrected address (this should be the total number of subjects to whom at least one additional invitation has been sent)

Outstanding - Letter was sent to subject less than one month ago

** A separate table should be prepared for the second screening examination

Table 2.   Results of Contacts with Subjects for Screening Cycle 2

	Selection I (Records Selected = 19735)			Selection II (Records Selected = 19453)			Total (Record Selected = 39188)		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Address Found	12877	■	320	10065	■	653	22942	■	973
Invitation Sent	905	100.0	210	53	100.0	21	958	100.0	231
Second Invitation	618	100.0	117	39	100.0	13	657	100.0	130
Accepted	181	29.29	16	11	28.21	3	192	29.22	19
Refused	0	0.00	0	0	0.00	0	0	0.00	0
Did Not Respond	374	60.52	81	20	51.28	4	394	59.97	85
Incorrect Address	10	1.62	0	1	2.56	0	11	1.67	0
Temporarily Absent	27	4.37	4	0	0.00	0	27	4.11	4
Outstanding	7	1.13	7	4	10.26	4	11	1.67	11
Other	19	3.07	9	3	7.69	2	22	3.35	11
Subsequent Invitation	287	100.0	93	14	100.0	8	301	100.0	101
Accepted	62	21.60	9	0	0.00	-1	62	20.60	8
Refused	0	0.00	0	0	0.00	0	0	0.00	0
Did not Respond	161	56.10	28	8	57.14	3	169	56.15	31
Incorrect Address	4	1.39	3	0	0.00	0	4	1.33	3
Temporarily Absent	3	1.05	-2	0	0.00	0	3	1.00	-2
Outstanding	40	13.94	40	5	35.71	5	45	14.95	45
Other	17	5.92	15	1	7.14	1	18	5.98	16

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Selection I - the first 19735 subjects who were selected from the dose files

Selection II - the remaining subjects in the dose files who were selected at the end of 1999

Temporarily Absent - subject is in the military, prison, school, hospital, or on vacation and is temporarily away from his/her permanent address

Subsequent Invitation - an invitation was previously sent to a subject and they refused, didn't respond, or the address was incorrect; a second or subsequent invitation was sent, possibly with additional information or corrected address (this should be the total number of subjects to whom at least one additional invitation has been sent)

Outstanding - Letter was sent to subject less than one month ago

** A separate table should be prepared for the second screening examination

Table 3.　　*Results of Previous Contact with Subjects Who Were Screened in Screening Cycle 1 (Baseline Examination Only)*

	Selection I (Records Selected = 19735)			Selection II (Records Selected = 19453)			Total (Record Selected = 39188)		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Total Who Came to Screening Examination	6268	100.0	319	3136	100.0	504	9404	100.0	823
Accepted Invitation	5991	95.58	140	2826	90.11	247	8817	93.76	387
Refused Invitation	0	0.00	0	0	0.00	0	0	0.00	0
Did Not Respond*	147	2.35	116	215	6.86	191	362	3.85	307
Other	119	1.90	62	93	2.97	66	212	2.25	128

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report
Selection I - the first 19735 subjects who were selected from the dose files
Selection II - the remaining subjects in the dose files who were selected at the end of 1999
* - Indicated in the data base since 1.06.2000

Table 4.   Place of Screening for Subjects Who Were Screened in Screening Cycle 1 (Baseline Examination Only)

	Selection I (Records Selected = 19735)			Selection II (Records Selected = 19453)			Total (Record Selected = 39188)		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Total Who Came to Screening Examination	6268	100.0	319	3136	100.0	504	9404	100.0	823
Examined at Fixed Center in Minsk	3640	58.07	105	1974	62.95	337	5614	59.70	442
Examined at Fixed Center in Gomel	321	5.12	153	268	8.55	92	589	6.26	245
Examined by Mobile Team	2280	36.38	61	894	28.51	75	3174	33.75	136
Other*	27	0.43	0	0	0.00	0	27	0.29	0

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Selection I - the first 19735 subjects who were selected from the dose files

Selection II - the remaining subjects in the dose files who were selected at the end of 1999

* - Cohort subjects examined in the Dispensary of Radiation Medicine but not by the Project stuff.

Table 5.   Status of Screening Activities for Subjects Who Were Screened in Screening Cycle 1 (Baseline Examination Only)

	Selection I (Records Selected = 19735)			Selection II (Records Selected = 19453)			Total (Record Selected = 39188)		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Total Who Came to Screening Examination	6268	100.0	319	3136	100.0	504	9404	100.0	823
Subject had Complete Screening Examination	6174	98.50	315	3086	98.41	494	9260	98.47	809
Subject Missed at Only One Station	61	0.97	2	47	1.50	10	108	1.15	12
Subject Missed Blood Draw Only	12	0.19	1	10	0.32	2	22	0.23	3
Subject Missed Urine Collection Only	27	0.43	1	30	0.96	7	57	0.61	8
Subject Missed Dosimetry Interview Only	22	0.35	0	7	0.22	1	29	0.31	1
Subject Missed Only One Other Station	0	0.00	0	0	0.00	0	0	0.00	0
Subject Missed More than One Station	33	0.53	2	3	0.10	0	36	0.38	2

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report
Selection I - the first 19735 subjects who were selected from the dose files
Selection II - the remaining subjects in the dose files who were selected at the end of 1999

Table 6. *Preliminary Results of Screening Examination for Subjects Who Were Screened in Screening Cycle 1 (results of follow-up visits in two years included)*

	Selection I (Records Selected = 19735)			Selection II (Records Selected = 19453)			Total (Record Selected = 39188)		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Total Who Came to Screening Examination	6268	100.0	319	3136	100.0	504	9404	100.0	823
1. No Thyroid Abnormalities (Follow in 2 Years)	4222	67.36	226	2175	69.36	372	6397	68.02	587
2. Subject Has Single or Multiple Nodules	453	7.23	85	238	7.59	81	691	7.35	159
2.1 At least 1 nodule > 10 mm	162	2.58	20	59	1.88	17	221	2.35	37
2.2 At least 1 nodule > 5 mm but none > 10 mm	258	4.07	59	154	4.91	56	412	4.38	108
2.3 No nodules > 5 mm	33	0.53	6	25	0.79	8	58	0.63	14
3. Parathyroid Dysfunction (Yes or Suspicion)	25	0.40	1	4	0.13	0	29	0.31	1
4. Lymphadenopathy	324	5.19	15	77	2.46	14	401	4.27	29
5. Other Thyroid Abnormality	1495	23.85	92	714	22.77	129	2206	23.46	228
6. History of Thyroid Surgery Prior to Screening	49	0.78	2	9	0.29	3	58	0.62	5
6.1 Thyroid Cancer	40	0.64	1	4	0.13	1	44	0.47	2
6.2 Thyroid Adenoma	9	0.14	1	5	0.16	2	14	0.15	3
7. Insufficient Information to Complete Preliminary Summary	0	0.00	0	0	0.00	0	0	0.00	0

Definitions:

Selection I - the first 19735 subjects who were selected from the dose files

Selection II - the remaining subjects in the dose files who were selected at the end of 1999

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Total Subjects Screened - total number of subjects who came to the first screening examination

History of thyroid cancer prior to screening - subject was diagnosed/treated for thyroid cancer before coming to the first screening examination

Table 7.   *Fine Needle Aspiration Results from Screening Cycle 1 (Baseline Examination Only)*

	Cumulative Total		Change Since Previous Quarter
	#	%	#
Subject requested for FNA	467	100.0	83
Subject was screened at Minsk Fixed Center	279	59.74	49
Subject was screened at Gomel Fixed Center	67	14.35	26
Subject was screened by Minsk Mobile Team	121	25.91	8
Subject was screened by Gomel Mobile Team	0	0.00	0
Subject has NOT undergone FNA	247	52.89	43
Subject was screened at Minsk Fixed Center	118	25.27	18
Subject was screened at Gomel Fixed Center	49	10.49	17
Subject was screened by Minsk Mobile Team	80	17.13	8
Subject was screened by Gomel Mobile Team	0	0.00	0
Subject HAS undergone FNA	220	47.11	40
1 FNA positive or suspicious for thyroid cancer	34	7.28	2
2 FNA positive or suspicious for other neoplasm	24	5.14	3
3 FNA not suspicious for neoplasm	107	22.91	21
4 Sample(s) Inadequate for Diagnosis	55	11.78	14

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Table 8.   *Laboratory Tests Processed*

	Cumulative Total		Change Since Previous Quarter
	#	%	#
1. Blood Samples Received	7838	100.0	408
1.1 Blood Samples Processed for TSH	6077	77.53	307
1.1.1 Blood Samples Processed for Free T4	277	3.53	0
1.2 Blood Samples Processed for anti TPO	5536	70.63	307
1.2.1 Blood Samples Processed for anti Tg	5563	70.97	307
1.3 Blood Samples Processed for Tg	4586	58.51	306
1.4 Blood Samples Processed for Ca++	5572	71.09	307
1.4.1 Blood Samples Processed for PTH	1	0.01	0
2. Urine Samples Received	8482	100.0	468
2.1 Urine Samples Processed	8458	99.72	468

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Samples Received - the number of subjects for whom samples have been received by the laboratory

Samples Processed - the number of subjects for whom each specific laboratory analyses has been completed

Table 9. Final Endocrine Summary Results for Subjects Who Were Screened in Screening Cycle 1 (results of follow-up visits for two years and new cases are included)*

	Selection I			Selection II			Total		
	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter	Cumulative Total		Change Since Previous Quarter
	#	%	#	#	%	#	#	%	#
Total Subjects Screened	6268	■	319	3136	■	504	9404	■	823
Final Endocrine Summary Report Completed	3606	100.0	0	722	100.0	0	4328	100.0	0
1. No thyroid abnormality (Follow in 2 years)	2397	66.47	0	529	73.27	0	2926	67.61	0
2. Thyroid abnormality (ICD-9 Code)	263	7.29	0	42	5.82	0	305	7.05	0
2.1 Malignant neoplasm of thyroid gland (193)	6 (35*)	0.17	0	0(8*)	0.00	0	6 (43*)	0.14	0
2.2 Benign neoplasm of thyroid gland (226)	0 (9*)	0.00	0	0	0.00	0	0 (9*)	0.00	0
2.3 Simple and unspecified goiter (240.9)	63	1.75	0	8	1.11	0	71	1.64	0
2.4 Nontoxic nodular goiter (241)	96	2.66	0	21	2.91	0	117	2.70	0
2.4.1 Uninodular (241.0)	76	2.11	0	15	2.08	0	91	2.10	0
2.4.2 Multinodular (241.1)	20	0.55	0	6	0.83	0	26	0.60	0
2.5 Thyrotoxicosis with or without goiter (242)	13	0.36	0	0	0.00	0	13	0.30	0
2.5.1 Toxic diffuse goiter (242.0)	13	0.36	0	0	0.00	0	13	0.30	0
2.5.2 Toxic uninodular goiter (242.1)	0	0.00	0	0	0.00	0	0	0.00	0
2.5.3 Toxic multinodular goiter (242.2)	0	0.00	0	0	0.00	0	0	0.00	0
2.5.4 Thyrotoxicosis without goiter (242.4 - 242.9)	0	0.00	0	0	0.00	0	0	0.00	0
2.6 Hypothyroidism (244)	1	0.03	0	0	0.00	0	1	0.02	0
2.7 Other Thyroid Disorders (237.4,245, 246)	83	2.30	0	13	1.80	0	96	2.22	0
2.7.1 Autoimmune thyroiditis (245.2)	35	0.97	0	2	0.28	0	37	0.85	0
3. Hyperparathyroidism (252.0)	0	0.00	0	0	0.00	0	0	0.00	0
4. Hypercalcemia (275.42)	317	8.79	0	181	25.07	1	498	11.51	1
Subject Has Been Notified of Examination Results	0	0.00	0	0	0.00	0	0	0.00	0

Definitions:

Selection I - the first 19,000 subjects who were selected from the dose files

Selection II - the remaining subjects in the dose files who were selected at the end of 1999

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Total Subjects Screened - total of the number of subjects who came to the first screening examination

Final Endocrine Summary/Pathology Completed – the total number of subjects for whom the final endocrine summary report has been completed, and Hospitalization Form (if applicable) and Pathology Form (if applicable) have been completed

Results from final endocrine summary after all laboratory testing is complete and pathology reports obtained (for subjects with FNA/surgery)

* - Final Summary is missing

- *Table 10. Data Management*

	Cumulative Total		Change Since Previous Quarter
	#	%	#
Total Subjects Screened	9404	100.0	1191
Screening Forms Key Entered	8848	94.09	1166
Dosimetry Questionnaires Key Entered	7944	84.47	680
Urine Processing Forms Key Entered	8537	90.78	843
Blood Processing Forms Key Entered	6373	67.77	416
Final Endocrine Summary Forms Key Entered	3991	42.44	8
FNA Results Forms Key Entered	304	3.23	43
Pathology Forms Key Entered	0	0.00	0
Initial Abstract Forms Key Entered	22641	■■■	2794
Hospital Clinic Forms Key Entered	442		61
Hospital Oncopathology Forms Key Entered	98		6

Definitions:

Cumulative Total - the cumulative total up to the ending date on the title page of this report

Current Quarter - total number for this quarter beginning and ending with the dates on the front page of this report

Total Subjects Screened - total of the numbers of subjects screened in Screening Cycle 1

Screening Forms Key Entered - total number of subjects for whom all forms filled out on the day of screening
(from registration through preliminary endocrine summary) have been key-entered

BELAM THYROID STUDY

Tasks and milestones for the second quarter (01.10.2000-31.12.2000)

Task No. 1: The management and administration of the BelAm Thyroid Study

Milestone 1: Weekly meetings with the group leaders to discuss the progress of the Project, and their reflection in the minutes.

Milestone 2: Administrative support of cohort establishment to supply access to various informational sources, especially sources of address information.

Milestone 3: Coordination between Belarus and U.S. participants with respect to all activities of the Project.

Milestone 4: Prepare materials for publication in newspapers and radio broadcasting aimed at Project promotion in mass media.

Task No. 2: The establishment of the cohort of subjects for study

Milestone 5: Work to locate provisional cohort of 12.000 and select at least 2.100 accessible to the Minsk Dispensary and to the mobile team.

Milestone 6: Determine the location of geographical areas with great number of people with identified current addresses for possible examination by mobile teams.

Milestone 7: Conduct epidemiological interview of the cohort subjects to find out the ways of intensifying of cohort establishment.

Milestone 8: Continue creating initial data base of exposed "in utero".

Task No. 3: The invitation and scheduling of subjects for endocrinologic examination

Milestone 9: Preparation of the letters of invitation, software, and procedures for inviting and scheduling subjects for examination.

Task No. 4: The endocrinologic examination of subjects, including subsequent diagnostic procedures leading to the establishment of the final pathologic diagnosis

Milestone 10: Screening up to 2100 subjects in Minsk Dispensary, including the laboratory laboratory activity for collecting and processing of blood and urine samples.

Milestone 11: Clinical examination and verification of diagnosis in patients with revealed pathology.

Milestone 12: Conduct the cytological and pathomorphological aspects of the Project.

Milestone 13: Expert support of screening activities.

Task No. 5: Operational Manual and Project Forms

Milestone 14: Updating of the Operational Manual and study forms.

Milestone 15: Development of instructions for filling in and data entry of epidemiological, screening, laboratory, and hospitalization forms.

Milestone 16: Development of quality assurance manual.

Task No. 6: Data Management

Milestone 17: Design of part of data entry software for epidemiological, screening and hospitalization information.

Milestone 18: Data entry of epidemiological, screening, laboratory, and hospitalization forms. Maintain epidemiological, screening, laboratory, and hospitalization data bases.

Milestone 19: Transfer to the DCC file server the data, entered in local computers of the screening center and central laboratory, and quality control of these data.

Milestone 20: Design software for quality assurance of screening, epidemiological, and laboratory data.

Milestone 21: Design a part of the query software for the epidemiological, screening and hospitalization data.

Milestone 22: Analysis of the results and preparation some progress and quality assurance reports on the cohort selection, scheduling of screening exams, subject flow through exams and data entry.

Milestone 23: Design of image processing procedures, and data base of thyroid images.

Milestone 24: Set up DB of epidemiologic information, completion of initial abstract form (morbidity) for subjects undergone examination.

Task No. 7: The estimation of individual thyroid doses for members of the cohort

Milestone 25: Conduct personal interviews for all subjects screened in the Project. Quality control of interview.

Milestone 26: Enter to the data base information from the interviews. Quality control of data entry.

Milestone 27: Continue key entry of original dosimetry information for Mogilev oblast into the data base.

Milestone 28: Design the structure of the operational manual for dosimetry.

Milestone 29: Development of integrated system for processing and presenting of calibration coefficients for the instruments used for thyroid radiometry.

BelAm Study of Thyroid Cancer and Other Thyroid Diseases in Belarus
Following the Chornobyl Accident

Task No. 7: The estimation of individual thyroid doses for members of the cohort

REPORT OF THE DOSIMETRY GROUP FOR THE THIRD QUARTER, 2000.

Minsk 2000

Milestone 25: *Conduct personal interviews for all subjects screened in the Project. Quality control of interview.*

For the whole period of Project activity the total number of subjects having been interviewed is 10192 inds., 8825 of them came to base line examination, and 1367 to follow up visit.

For the period of July 1 to September 30, 2000, 604 subjects have been interviewed, 577 of them initially and 27 repeatedly. The information was collected in the Dispensary and in field during mobile team activity in Gomel and Mogilev oblasts.

Distribution of subjects with respect to the place of interview

	Initial	Subsequent	Total
Dispensary (Minsk)	442	24	466
In field	135	3	138
Total	577	27	**604**

The subjects came to interview:

	initial	subsequent	total
·on one's own	428	16	444
·together with mother	107	11	118
·together with father	18	0	18
·together with sister or brother	18	0	18
·with other accompanying	6	0	6
Total	577	27	**604**

Distribution of subjects' answers with respect to the quality of obtained data is shown in Table 25.1

Table 25.1

Results of interviews with respect to the completeness of the subjects answers

Estimation of quality	initial	Subsequent	Total
good	300 ·	13	313
satisfactory	194	8	202
unsatisfactory	83	6	89
Total	577	27	**604**

For the third quarter 15 questionnaires have been completed on mothers in the period of breast-feeding. For one cohort subject the questionnaire was completed only on mother as far as the subject was born in July, 1986. 50 cohort subjects having come to recall examination for the third and fourth time were not interviewed, as it was no need.

Age distribution of cohort subjects come to interview in the second quarter is given in Fig..25.1.
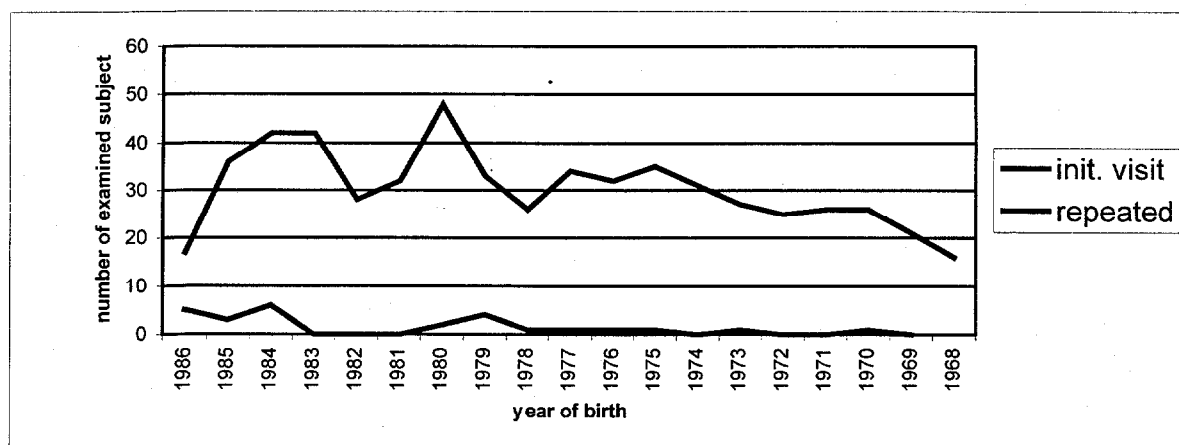
Fig.25.1. Age distribution of cohort subjects having been interviewed during the third quarter of 2000.

Distribution of subjects having been interviewed for the whole period of Project activity is presented in Table 25.2.

Table 25.2

Distribution of subjects having been interviewed for the whole period of Project activity 1996 – 2000

Year of examination	Initial interview	Subsequent interview	Total
1996–1997	1315	–	1315
1998	2120	441	2561
1999	2416	720	3136
2000	2974	206	3180
Total	8825	1367	**10192**

Distribution of subjects' answers with respect to the quality of obtained data from the initial and subsequent interviews for the whole period of 1996-2000 is shown in Table 25.3.

Table 25.3

Results of interviews with respect to the completeness of the subjects answers for the period of 1996 – 2000

year	good		satisfactory		unsatisfactory		total
	initial	subsequen	initial	subsequent	subsequen	initial	
1997	–	–	–	–	–	–	1315
1998	912	189	954	198	254	54	2561
1999	1034	311	731	246	651	163	3136
2000	1414	133	1131	51	429	22	3180
Total							**10192**

Age distribution of cohort subjects at the moment of the accident having been examined during the period of 1996-2000 according to the information of the DCC is presented in Fig. 25.2
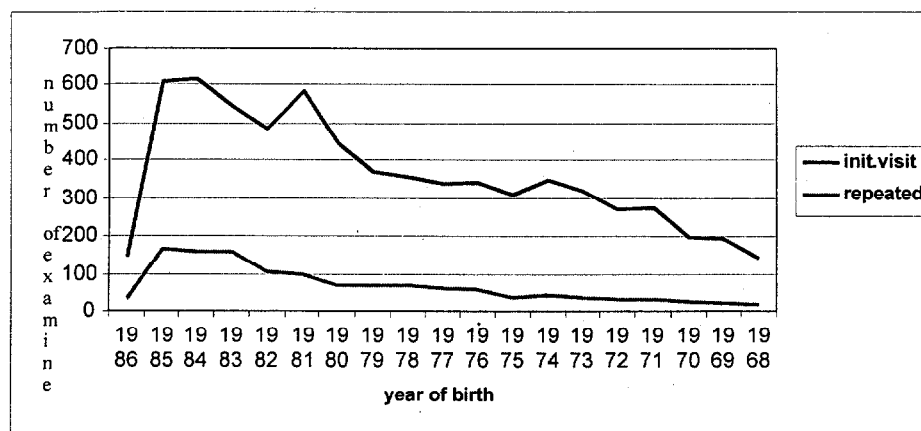
Fig. 25.2. Age distribution of cohort subjects at the moment of the accident having been examined during the period of 1996-2000

QUALITY CONTROL OF THE INTERVIEW.

QC of "Individual Interview Form" has been performed. It covered the period of 1.06.00 - 31.08.00. Number of completed forms for this period was **654.** Approximately each fifth interview form has been checked; so the number of reviewed forms was **141.**
Table 25.4 presents the results of quality control of Interview Form completion.

<div align="right">

Table 25.4
</div>

# of question	Made errors	Number of error
9b	**# of floor is not put in**	**2**
11	The field "duration of staying" in the table of movements in 1986 is not completed	2
14c	The period of limitation of staying outdoor is not marked	2
15a	**Type of iodine medication is not marked**	**1**
16a	**The table of milk consumption following the accident is not completed**	**6**
16a	**The dates in the table of movements (question 11) does not correspond to the table of milk consumption following the accident**	**3**
16b	**The date of milk consumption cancel is not put in (wrong)**	**9**
19a	Table of green leafy vegetables consumption is not completed.	1

By the results of QC of completed Individual Interview Forms appropriate notes has been prepared for each interviewer. This note contains individual comments and recommendations. Each comment that should be corrected by the interviewer contains subjects ID so that it will be easy to find appropriate interview form and make necessary corrections.

Milestone 26: Enter to the data base information from the interviews. Quality control of data entry.

In the third quarter the personnel of the Dosimetry Group continued entering to the DB data of the initial interview and the repeated one. In the third quarter 240 interview forms of the current year and 1012 of the previous period of 1999-2000 have been keyed to the DB. All in all for the whole period of Project activity the information on 9253 subjects has been entered.

Results of quality control of data entry

QC of data entry has been performed for the period of 1.06.00 - 31.08.00. the number of entered interview forms for the mentioned period was **469**, and -87 of them have been reviewed.

table 26.1 presents the results of quality control of key entry to the dosimetry data base.

Table 26.1

# of question	Made mistakes	Number of mistakes
3	**Wrong current last name of subject**	**1**
2	**Missed information (wrong information) on participants of the interview**	**4**
11	**Incomplete information in the table of moves out in 1986**	**1**
16a	**Incomplete information in the table of milk consumption following the accident**	**5**
15	**Incomplete data on iodine prophylaxis**	**4**
18	**Entered information on dairy produce does not correspond to questionnaire**	**1**
96	**Entered number of floor in the building does not correspond to questionnaire**	**3**
1	**Wrong date of interview**	**1**
16c	**Missed information of starting date of cattle pasturing**	**2**
19	Missed information in the table of green leafy vegetables consumption.	**1**
	No quality estimate (wrong) for separate blocks of questions	**6**

By the results of QC of Individual Interview Forms entry appropriate notes has been prepared for each operator. This note contains made mistakes of data entry and ID of questionnaires to be corrected

Milestone 27:   Complete estimating reliability of answers for 100 subjects through comparison of the results of initial and repeated interviews.

Introduction

For the purpose of estimation of individual thyroid dose for the period since receipt till cleaning of iodine radioisotopes from the human body it is necessary to know not only the results of thyroid dosimetry examination but also individual information on penetration route and dynamics of iodine radioisotopes in the body. For this purpose an individual interview of subjects is conducted under the Project using specially developed dosimetry questionnaires. The interview was started in 1997 and is going on currently. For this period a group of cohort subjects has been interviewed twice. Besides the interview conducted under the Project, in 1988 dosimetry interview was conducted among the citizens of most contaminated raions of Gomel and Mogilev oblasts. The questionnaires of both interviews differ in number of questions and interview terms.

The purpose of the work was to compare dosimetry information obtained in the course of the interview performed in 1988 vs. during the Project activity in 1997-2000.

Materials and methods

To conduct comparative analysis of dosimetry information 100 subjects have been selected (from the total number of 121) to whom the Dosimetry Group had the results of interview of 1988 and who went through initial and repeated interview in the framework of the Project

Comparison of dosimetry information was performed using Microsoft Excel 7.0.

Short descriptions of conducted interviews are presented below.

Interview conducted in 1988.

Interview conducted in 1988 included 5 questions:

1. Starting date of cattle pasturing in spring 1986.
2. Date of evacuation (move out) from contaminated territory in April-May 1986.
3. Iodine prophylaxis: starting date of iodine medicines intake and number of days of intake.
4. Amount of milk used to be drunk per day (liters).
5. Date of canceling of milk consumption in the period of April- May 1986.

By the results of the 1988 interview for each of 100 selected there is information on all 5 questions

Interview terms are unknown.

Interview conducted under the Project, 1997-2000rr.

Interview was conducted in the Dispensary (Interview Station) and in field. The subjects were interviewed in accordance with specially developed dosimetry questionnaire containing the following blocks of questions: passport section, travel route, way of life, iodine prophylaxis, milk consumption, dairy produce consumption, green leafy vegetables consumption, current food allowance, radiation treatment. Dosimetry interview form also included the following information: date of interview, participants, quality estimates made by interviewer. Given below diagrams present the description of initial and repeated interviews.

Diagrams 27.1 and 27.1a present information concerning time when interviews (initial and repeated) were conducted.
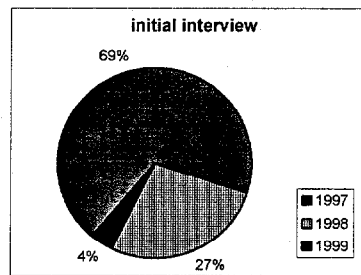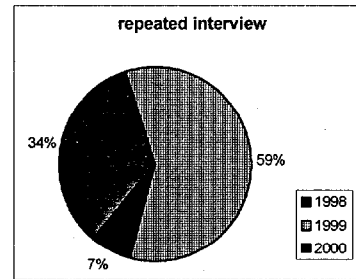
Diagram 27.1.	Diagram 27.1a.

It is evident from the presented diagrams that for the majority of subjects interval between the initial and repeated interview was at average 2 years

Diagrams 27.2 and 27.2a present an information on participants of initial interview and quality estimation of conducted interview from the point of view of the interviewer for children under 10 years of age and older than 10 years at the time of accident respectively.

Diagrams 27.3 and 27.3a present similar information for the repeated interview.

Division of cohort subjects into two age groups was made supposing that children under 10 years of age at the moment of the accident could answer the questions of the questionnaire themselves (without their parents).

About 65% of subjects aged <10 at the moment of the accident and about 10% of subjects aged > 10 at the moment of the accident showed up at initial interview in accompany of their parents.

At the repeated interview about 40% of subjects aged <10 at the moment of the accident and about 3% of subjects aged > 10 at the moment of the accident showed up in accompany of their parents,

Only 2% of subjects at initial interview showed up alone, but at the repeated interview were accompanied by their parents.
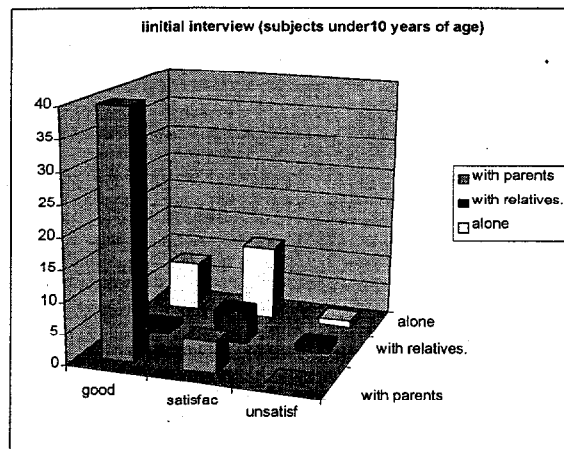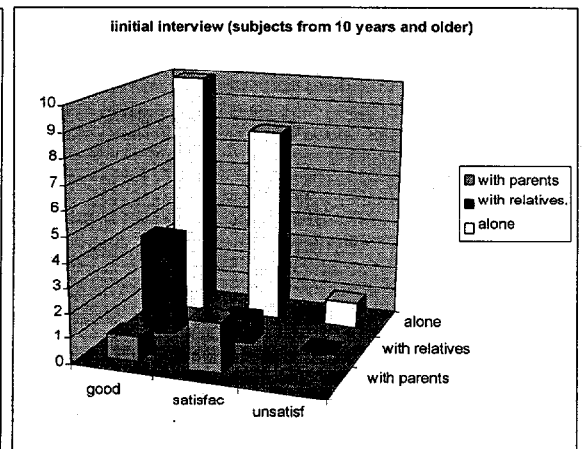
Diagram 27.2.	Diagram 27.2a.
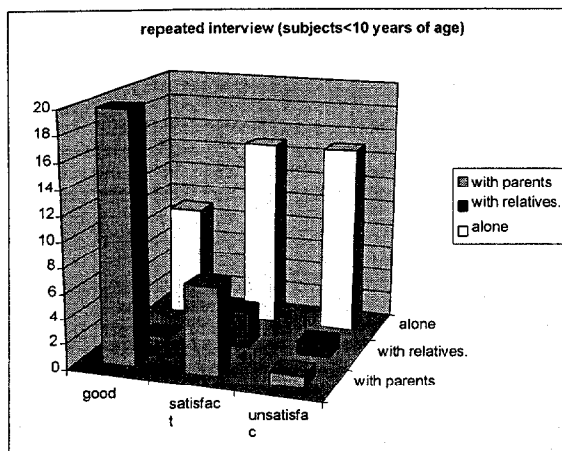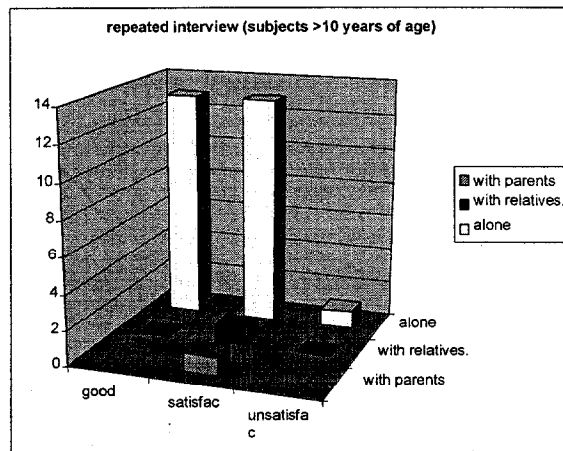
Diagram 27.3.   Diagram 27.3a.

That is why the number of interviews estimated as unsatisfactory at the initial interview was 3%, and the number of interviews estimated as unsatisfactory at the repeated interview increased significantly and was 21%, including 19% of interviews of subjects aged <10 at the moment of the accident who came to the repeated interview without parents.

Comparative analysis of the interview results conducted in 1988 vs. interview conducted under the Project included 5 questions of 1988 interview listed above. In 96% of cases (except the question concerning starting date of cattle pasturing) the results of initial interview in the framework of the Project were compared with the results of interview 1988. In 4% of cases the results of the repeated interview were compared because in 2% of cases there was unsatisfactory quality of initial interview, and in 2% of cases subject came to initial interview alone and to the repeated – with parents

The question of starting date of cattle pasturing was included only in 7% of questionnaires of initial interview and 33% questionnaires of repeated interview. Therefore, if the questionnaire of the initial interview did not include this question, the results of the repeated interview were compared with the results of interview 1988.

Comparative analysis of the results of the initial and repeated interviews conducted in the framework of the Project included 5 questions listed above and three questions in addition:
- Did the subject consume dairy produce in April-May 1986.
- Did the subject consume green leafy vegetables in April-May 1986.
- When did the subject start consuming green leafy vegetables

That is why comparative analysis of the results of initial and repeated interviews covered all the questions that could be used while estimating internal thyroid dose from iodine radioisotopes

Results and discussion
I.   Starting date of cattle pasturing in spring 1986.
This question was included only in 40% of Project questionnaires.

The result of comparison – **similarity,** when:
1. Pasturing started before the accident regardless exact date;
2. Pasturing started following the accident and starting dates of pasturing are similar ± 1 day;

The result of comparison – **convergence**, when pasturing started following the accident and starting dates varied for more than one day.

Result of comparison – **lack of information**, when:

1. To the question of starting date of cattle pasturing the answer was "do not remember" at least at one interview;

2. Given question was not included to the questionnaire.

Diagrams 27.4 and 27.4a present the result of comparison for the interview conducted in 1988 vs. interview conducted under the Project, and initial interview vs. repeated accordingly.
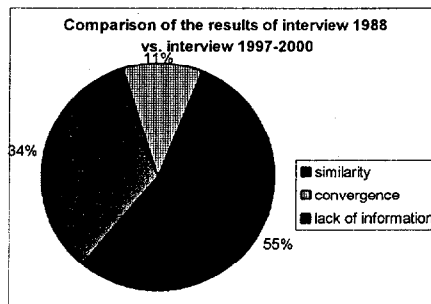
Diagram 27.4.
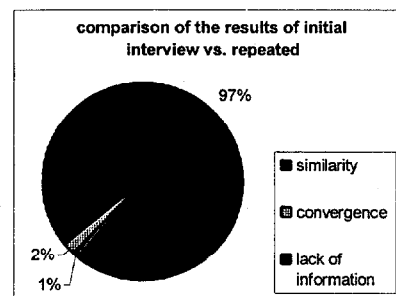
Diagram 27.4a.

Comparison of the results of interview 1988 vs. interview 1997-2000.

As it is evident from presented diagrams recurrence of responses is 34%.

Comparison of the results of interview 1988 vs. interview conducted under the Project 1997-2000 could not reflect of responses because the question of starting date of cattle pasture was not included in the majority of questionnaires of 1997-2000

Comparison of the results of initial and repeated interviews.

There is no need to speak about recurrence of responses while comparing the results of repeated interviews with initial because 93% of questionnaires of the initial interview did not contain this question.

II.   **Moves out from contaminated territory in April-May 1986.**

Result of comparison – similarity, when:

1. Dates of moves out are similar ±1 день;

2. By the result of both interview the subject did not move out from contaminated territory in April-May 1986;

The result of comparison – **convergence**, when:

1. Dates of moves out varied for more than 1 day;

2. By the result of one interview the subject moved out from contaminated territory, but by the results of other – did not;

Result of comparison – **lack of information**, when at least in one interview the answer was "do not remember".

Diagrams 27.5 and 27.5a present the result of comparison for the interview conducted in 1988 vs. interview conducted under the Project, and initial interview vs. repeated accordingly.
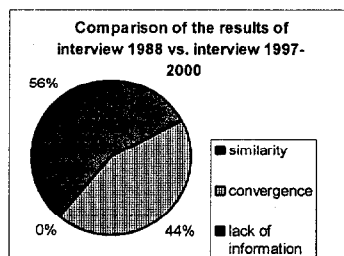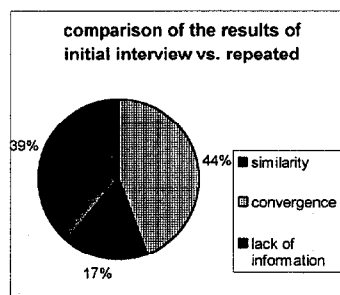
Diagram 27.5.

Diagram 27.5a.

Diagrams 27.6 and 27.6a reflect the results of convergence in moves out from contaminated territories by days while comparing 1988 interview vs. interview conducted in the framework of the Project, and initial interview vs. the repeated one accordingly.
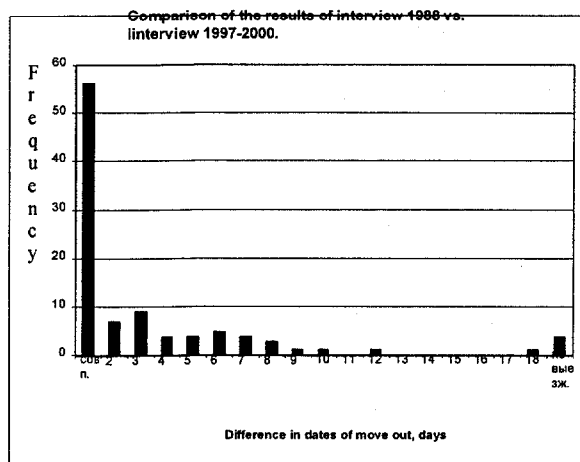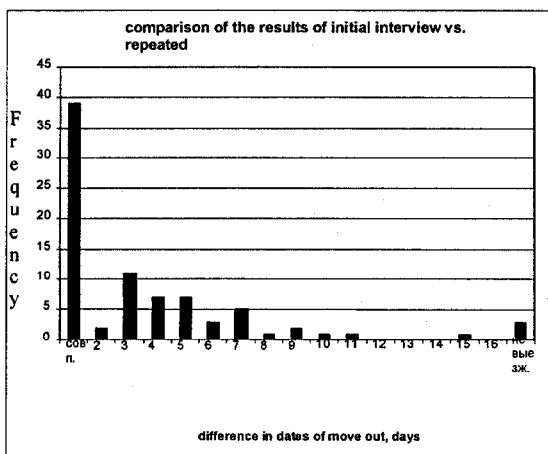

Diagram 27.6

Diagram 27.6a

Comparison of the results of interview 1988 vs. interview 1997-2000.
As it is evident from presented diagrams recurrence of responses is 56%. All the participants of the interview gave informative response i.e. "do not remember" was never said.
In case when there was difference in dates of move out, in the majority of cases it did not exceed 8 days.

Actually the fact of move out from contaminated territory disagreed only in 3% of cases. It means that participants of interview can recall the fact of move out rather good

Comparison of the results of initial and repeated interviews.
As it is evident from the presented diagrams recurrence of responses is 39 %. The response "do not remember " was given by 17% of interviewed subjects, mostly those who was under 10 years of age at the moment of the accident and showed up at repeated interview without parents.
In case when there was difference in dates of move out, in the majority of cases it did not exceed 9 days.
The fact of move out from contaminated territory disagreed only in 3% of cases.

III. Iodine prophylaxis in April-May 1986.

Result of comparison – **similarity**, when:

1. Iodine prophylaxis was not conducted;
2. Iodine prophylaxis was conducted and starting dates of stable iodine intake are similar ± 1 day and duration of the intake is the same. Number of days of stable iodine intake could disagree when prophylaxis in both cases was conducted before moving out from contaminated territory.
3. Iodine prophylaxis was conducted in different time but in both cases in the places of evacuation, or when in one case iodine prophylaxis was not conducted at all, and in other case it was conducted but in places of evacuation.

· The result of comparison – **convergence, when:**

1. from one interview it is clear that iodine prophylaxis was conducted before evacuation (move out) from the contaminated territory, and from the other interview – it was not conducted at all.
2. Iodine prophylaxis was conducted before evacuation (move out) from contaminated territory but starting dates of stable iodine intake are different.

The result of comparison – **lack of information**, when at least in one interview the answer was "do not remember".

Diagrams 27.7 and 27.7a present the result of comparison for the interview conducted in 1988 vs. interview conducted under the Project, and initial interview vs. repeated accordingly.
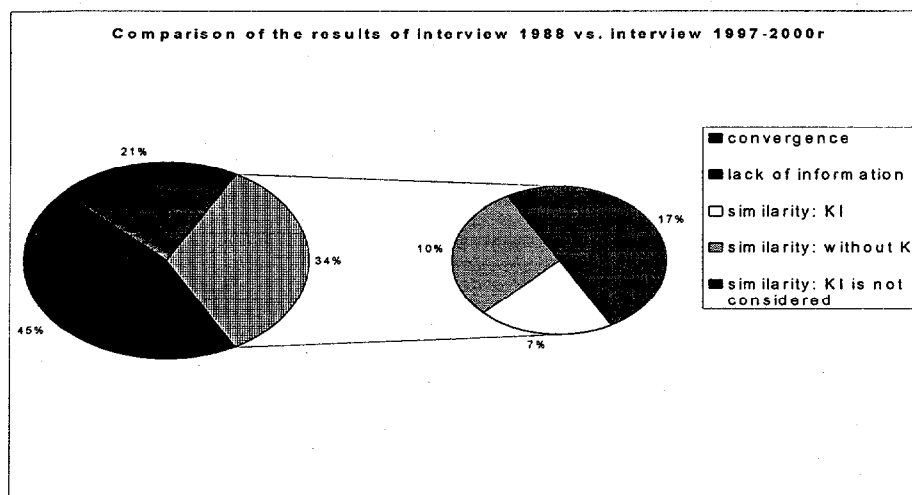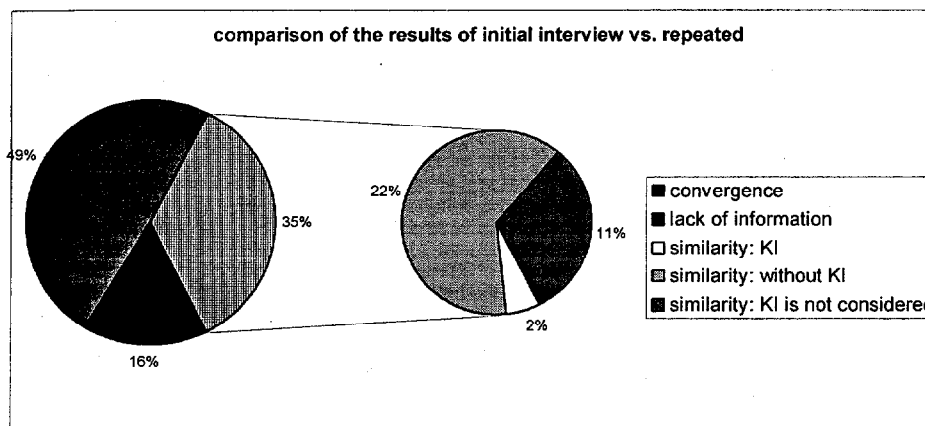

Diagram 27.7

Диаграмма 27.7а

Comparison of the results of interview 1988 vs. interview 1997-2000.

As it is evident from presented diagrams recurrence of responses is 34%. Answering the question of iodine prophylaxis 21% of interviewed participants (under the Project) gave "do not remember" answer.

Comparison of the results of initial and repeated interviews.

As it is evident from presented diagrams recurrence of responses is 35 %, and the answer "do not remember" was given in 49% of cases.

Thus, the fact of iodine prophylactics interviewed subjects could recall much worse than the fact of move out.

IV.   Amount of consumed milk per day (following the accident)

The result of comparison – **similarity**, when
1.   amount of consumed milk per day was the same ± 0.2 l,
2.   by the results of both interviews the subject did not consume milk at all

The result of comparison – **convergence,** when:
1.   Amount of consumed milk per day differed in 0.2 l,
2.   by the resul of one interview the subject consumed milk but by the result of another – did not.

The result of comparison – **lack of information**, when at least in one interview the answer was "do not remember".

Diagrams 27.8 and 27.8a present the result of comparison for the interview conducted in 1988 vs. interview conducted under the Project, and initial interview vs. repeated accordingly.
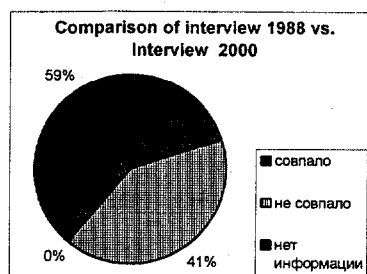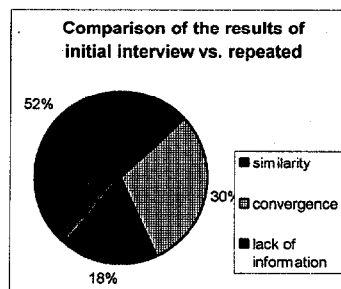

Diagram 27.8   Diagram 27.8a

Comparison of the results of initial and repeated interviews.

Diagrams show that recurrence of responses is 52 %. The response "do not remember " was given by 18% of interviewed subjects, mostly those who was under 10 years of age at the moment of the accident and showed up at repeated interview without parents.

Comparison of the results of interview 1988 vs. interview 1997-2000

As it is evident from presented diagrams that recurrence of responses is 59%.

All participants of the interview gave informative answer.

More detailed comparison of milk consumption by the result of interview 1988 vs. interview 1997-2000 is further presented.

Fig. 27.9 presents average milk consumption (l/day) in accordance to the results of the interview 1988 and interview 1997-2000.

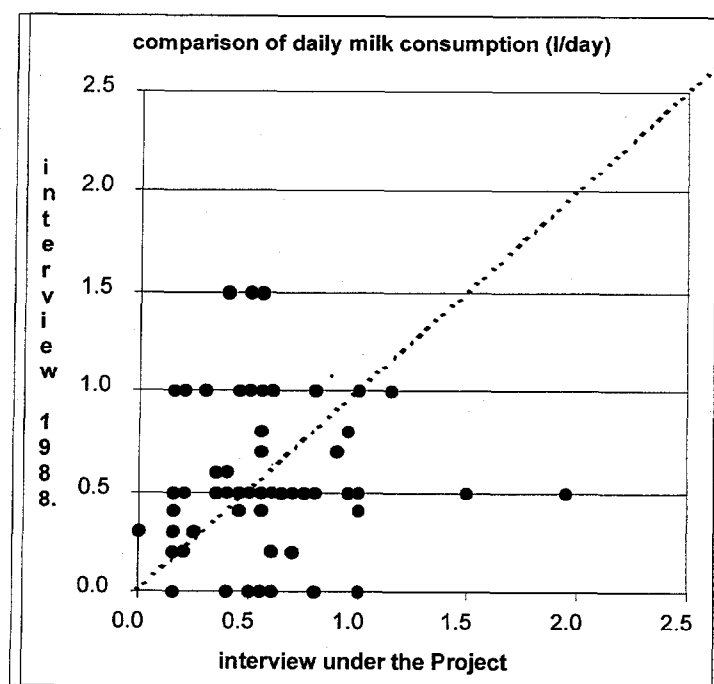**comparison of daily milk consumption (l/day)**

Fig. 27.9.

The results presented on Fig. 27.9 reflect recurrence of responses. As it is evident from the figure spread in values is rather significant but the majority of points are placed almost diagonally that evidences of similarity of values obtained in compared interviews.

Fig 27.10 presents distribution of ratios of average milk consumption based on the results of both interviews (where M_88 – average milk consumption (l/day) according to the interview 1988, M_project - average milk consumption (l/day) according to the nterview 1997-2000.)
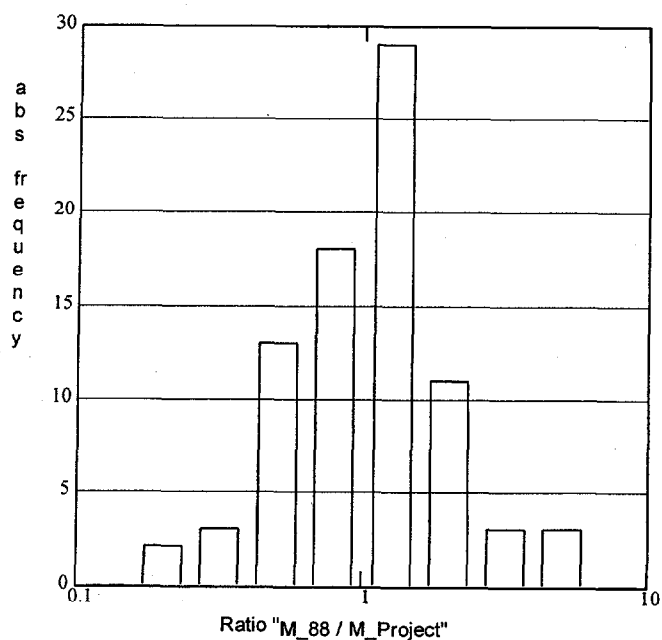

Ratio "M_88 / M_Project"

Fig. 27.10.

As it is evident from the figure given distribution could be described as close to lognormal. Description of given distribution is the following:

geometric mean-1.0 (geometric mean error (GME) = 1.9); median - 1.0.

Description of distribution evidences of recurrence of values (median and geometric mean values are equal to 1), and its small amount could be the reason of significant data scattering (GME = 1.9).

Fig. 27.11 presents frequency distribution of values of average milk consumption (l/day) according to the data of the interview 1988 and the interview 1997-2000.
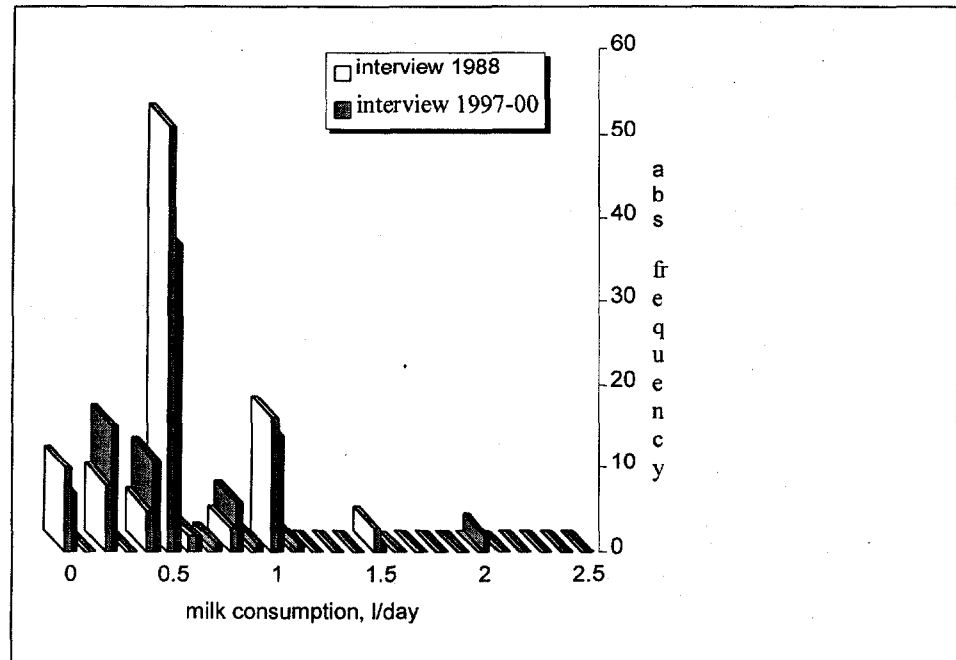

Fig. 27.11.

As it is evident from the Fig. 27.11 there is no observed systematic shift in the level of milk consumption while comparing the data of the interview 1997-2000 vs. the interview 1988.

By the results of the interview 1988 10% of subjects did not drink milk whereas by the results of the interview 1997-2000 3% of subjects did not drink milk.

V.   Date of canceling of milk consumption in April-May 1986

The result of comparison – **similarity**, when:

1. Dates of canceling of milk consumption are similar ±1 day;
2. By the results of both interviews the subject did not consume milk;

The result of comparison – **convergence**, when

1. Dates of canceling of milk consumption varied in more than one day
2. By the results of one interview the subject consumed milk, by the result of another – did not;

The result of comparison – **lack of information**, when:

To the question the answer was "do not remember" at least at one interview;

Diagrams 27.12 and 27.12a present the result of comparison for the interview conducted in 1988 vs. interview under the Project, and initial interview vs. repeated accordingly.

Comparison of the results of interview 1988 vs. interview 1997-2000

As it is evident from presented diagrams recurrence of responses is 41% that is lower than recurrence of responses to the question concerning the date of move out from the contaminated territory (56%).
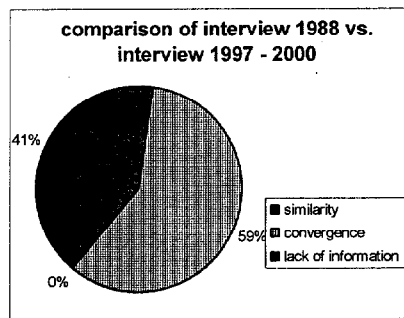

comparison of interview 1988 vs. interview 1997 - 2000

41%

59% ■ similarity
□ convergence
■ lack of information

0%

comparison of initial interview vs. repeated

40%

40% ■ similarity
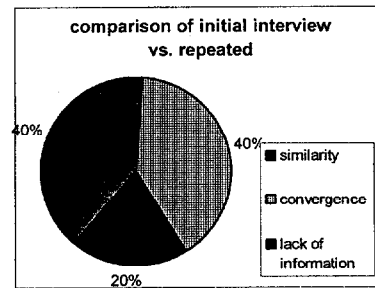□ convergence
■ lack of information

20%

| Diagram 27.12. | Diagram 27.12a. |

In general if subjects during the period April-May 1986 moved out from the contaminated territory so the date of canceling of milk consumption should correspond to the date of move out (if the subject consumed milk before move out), or it could be less than date of move out (if the subject canceled milk consumption before the day of move out).

In the interview of 1988 in 10 % of cases when the subject moved out from the contaminated territory during the period April-May 1986 the date of canceling of milk consumption is mentioned as 31.05.86. It seemed that information concerning the date of canceling of milk consumption of the Interview 1988 is not completely verified.

Thus, comparison of interview 1988 vs. interview under the Project can not give reliable information with respect to the recurrence of the responses concerning the date of canceling of milk consumption.

Comparison of the results of initial and repeated interviews.

Recurrence of responses during the repeated interview comparing to initial one is 40 %, that corresponds to recurrence of responses to the question concerning the date of move out from the contaminated territory (39%).

The response "do not remember " was given by 20% of initially interviewed subjects, mostly those who was under 10 years of age at the moment of the accident and showed up at repeated interview without parents.

As far as some of the questions were not included into the questionnaire of 1988 further the results of the comparison are presented for the initial interview vs. repeated.

VI.   Dairy produce consumption in April-May 1986

The result of comparison – **similarity**, when "yes" response was given in both interviews.

The result of comparison – **convergence**, when
In one interview the response was "yes", and in another – 'no'

The result of comparison – **lack of information**, when to the question the answer was "do not remember" at least in one interview;

Diagram 27.13 presents the results of comparison of initial interview with repeated one.
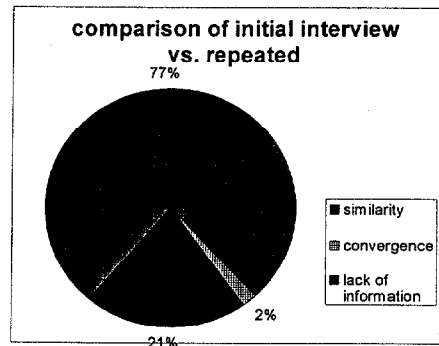
comparison of initial interview
vs. repeated
77%

■ similarity

▦ convergence

■ lack of
information

2%

21%

Diagram 27.13.

Recurrence of answers during the repeated interview as compared to initial one is 77%. The response "do not remember " was given by 21% of interviewed subjects, mostly those who was under 10 years of age at the moment of the accident and showed up at repeated interview without parents.

VII.   Consumption of green leafy vegetables in April-May 1986

The result of comparison – **similarity**, when "yes" response was given in both interviews.

The result of comparison – **convergence**, when

In one interview the response was "yes", and in another – 'no'

The result of comparison – **lack of information,** when to the question the answer was "do not remember" at least in one interview;

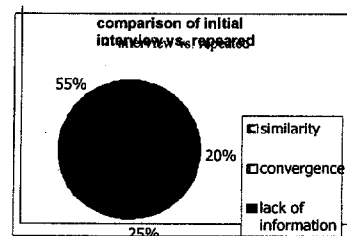Diagram 27.14 presents the results of comparison of initial interview with repeated one.

comparison of initial
interview vs. repeated

55%

20%

◘ similarity

◻ convergence

■ lack of
information

25%

Diagram 27.14

Recurrence of answers during the repeated interview as compared to initial one is 55%. The response "do not remember " was given by 25% of interviewed subjects, mostly those who was under 10 years of age at the moment of the accident and showed up at repeated interview without parents..

VIII.   Starting date of green leafy vegetables consumption.

The result of comparison – **similarity**, when:

1. The subject started consuming green leafy vegetables before the accident regardless exact date.

2. The subject started consuming green leafy vegetables following the accident and starting dates were similar ±1 day.

The result of comparison – **convergence**, when the subject started consuming green leafy vegetables following the accident and starting dates differs for more than one day

The result of comparison – **lack of information,** when to the question the answer was "do not remember" at least in one interview;

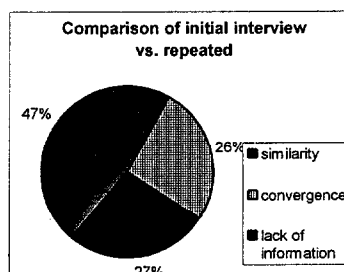Diagram 27.15 presents the results of comparison of initial interview with repeated one.

Diagram 27.15.

Recurrence of answers during the repeated interview as compared to initial one is 47%. The response "do not remember " was given by 27% of interviewed subjects, mostly those who was under 10 years of age at the moment of the accident and showed up at repeated interview without parents. Participants of the interview can recall the starting date of green leafy vegetables consumption worse than the fact of its consumption

Summary

1.   Comparison of information obtained in the interview of 1988 with that obtained under the project in 1997-2000 through the questions:
- Starting date of cattle pasturing in spring 1986.
- Conducting of iodine prophylaxis
- Date of canceling of milk consumption in April-May 1986

Can not give reliable information of the level of recurrence because:

1.   The question of starting date of cattle pasturing in spring 1986 was not included in the majority of questionnaires of 1997-2000.

2.   Information concerning iodine prophylaxis was missed in more than 25% of questionnaires of 1997-2000

3.   Information concerning date of canceling of milk consumption in April-May 1986 was not completely verified.

2.   Recurrence of information obtained in the interview of 1988 with that obtained under the project in 1997-2000 through the questions concerning the date of move out from the contaminated territory in April-May 1986 and average amount of milk consumed per day is about 60%. It is important to notice that there is no observed systematic shift in the level of milk consumption, regardless the time interval between the interviews was 10 years.

Lower recurrence of information with respect to these two questions is observed at repeated interview rather than at initial. It could be explained by the fact 25% less subjects aged < 10 years at the moment of the accident showed up at repeated interview accompanied by their parents.

3.   Recurrence of responses concerning dairy produce consumption and green leafy vegetables in April-May 1986 at repeated interview as compared to initial was in the range 55% -75%. The response "do not remember " was given by 25% of

interviewed subjects, mostly those who was under 10 years of age at the moment of the accident and showed up at repeated interview without parents.

Conclusion

If the interview is conducted in presence of the parents of the subjects aged < 10 y.o. at the moment of the accident, one could state the reliability of information to the majority of questions referred to 1986.

Milestone 28: *Consider possibility for Ukraine dosimetric model to be used in estimation of I-131 thyroid concentration in Belarus population.*

A possibility for Ukraine dosimetric model to be used in estimation of I-131 thyroid concentration in Belarus population as a grounds for unique algorithm for thyroid dose calculation in BelAm and UkrAm Projects [1], was considered through two aspects:
- Comparison of thyroid doses calculated by Belarus dosimetric model [2] using parameters of Belarus dosimetric model and parameters of joint dosimetric model.
- Estimation of sensitivity index for the parameters suggested in joint dosimetric model.

Five scenarios [Appendix 1], developed by Paul Voilleque in the first quarter, 2000 for the second intercomparison of the results obtained by Belarus, Ukrainian and Russian dosimetrists were taken as input data for comparison of thyroid exposure doses estimated by Belarus dosimetric model using two sets of parameters. The results of thyroid dose calculation through two sets of parameters are presented in table 28.1.

Table 28.1. Thyroid exposure doses calculated using 5 scenarios and two sets of parameters

Scenario	Thyroid exposure dose, mGy		Ratio of doses (Belarusian parameters / Joint parameters)
	Belarusian parameters	Joint parameters	
1	2584	2818	0.92
2	1258	1345	0.94
3	1841	2046	0.90
4	506	535	0.95
5	1025	1036	0.99

Estimation of sensitivity of joint dosimetric model to variability of used parameters was performed through the method of individual enumeration of parameters [3]. Using this method each model parameter takes average value. One parameter for which sensitivity index is estimated takes in series maximal and minimal values.

Sensitivity index for the parameters of joint dosimetric model was calculated through the following equation [4,5]:

$$SI = |1 - \frac{D_{min}}{D_{max}}|,$$
(28.1)

Where: SI – sensitivity index, extensible;

D_{min} – minimal thyroid exposure dose, when the parameter takes minimal or maximal value, mGy;

D_{max} – maximal thyroid exposure dose, when the parameter takes minimal or maximal value, mGy;

Scenario No 1 [Appendix 1] was used as input data for calculation of thyroid exposure dose. Model parameters and corresponding distribution [1], minimal and maximal values of the parameters and corresponding thyroid exposure dose, as well as sensitivity index of given parameter are presented in the table 28.2. In addition to the parameters suggested in [1], 2 more parameters have been considered.

It is assumed that:

- Density of daily ^{131}I fallout $P(t)$ has lognormal type of distribution when GSD=1.7 [4]. GM is estimated through the data of the scenario No1 [Appendix 1];

- Measured ^{131}I concentration in thyroid has lognormal type of distribution when GSD=1.7 [4]. GM is estimated through the data of the scenario No1 [Appendix 1];.

Table 28.2. Individual enumeration of parameters for calculation of thyroid exposure dose.

Parameter	Distribution	μ (σ) or mean (SD) or mode	Minimum (Dose)	Maximum (Dose)	SI
$Q(t_m)$ – ^{131}I activity in tyroid at the measurement time t_m, kBq	Lognormal	Ln(Q) ln(1.4)	20.7 (1458)	77.3 (5446)	0.732
$P(t)$ – ^{131}I daily deposition rate, (kBq m^{-2} d^{-1})	Lognormal	Ln(P(t)) ln(1.7)	Annex 1. (2846)	Annex 1. (2820)	0.009
V_g- ^{131}I deposition velocity on ground (max deposition velocity) (m d^{-1})	Lognormal	Ln(604.8) (0.693)^b	155.5 (2917)	2352 (2792)	0.043
Y_g – grass (leafy vegetables) yield (kg m^{-2})	Lognormal	0.41 (0.18) ^{b}	1.059 (2813)	2.144 (2827)	0.005
T_w- weathering half-life for grass (days)	Triangular	25.0^a	15 (3116)	30 (2745)	0.119
T_g - half-life due to growth dilution in May (days)	Triangular	18.0^a	13.0 (3056)	23.0 (2686)	0.121
Tc,b- - half-life of biological transfer of iodine into cow's milk (days)	Triangular	0.7^a	0.5 (2854)	1 (2753)	0.035
Tg,b- - half-life of biological transfer of iodine into goat's milk (days)	Triangular	0.7^a	0.5	1	
$T_b(age)$- half-life of biological decontamination of thyroid gland (days)	Lognormal	From [1] Ln(T_b) (0.1*ln(T_b))^b	14.8 (3304)	55.2 (2599)	0.213
$I_{g,c}$ – feeding rate for cow (kg d^{-1})	Uniform	50	40 (2839)	60 (2804)	0.012

Parameter	Distribution				
TFc,m – transfer factor feed cow's milk (d kg^{-1})	Lognormal	$-5.52\ (0.74)^{b}$	$9.393\ 10^{-4}$ (3026)	0.017 (2748)	0.092
WTh – fractional uptake by thyroid (dimensionless)	Triangular	0.3	0.17 (2818)	0.5 (2818)	0
M – thyroid mass (g)	Lognormal	From [1] $\ln(m_{th}/1.077)$ $(0.39)^{b}$	1.4 (6522)	6.46 (1413)	0.783
$r_1(i)$–respiratory values (m^3 d^{-1})	Lognormal	From [1]. $\text{Ln}(r_1(i))$ $(0.13)^{b}$	6.5 (2810)	10.8 (2828)	0.006
$E131,th$ – mean total energy absorbed per 1 decay of ^{131}I in thyroid (MeV per decay)	Triangular	0.20^{a}	0.19 (2677)	0.23 (3241)	0.174
$r_2(i)$ – daily comsumption rate for leafy vegetables	Normal	From Annex 1. $(0.017*0.4)^{c}$	$3.672\ 10^{-3}$ (2776)	0.03 (2854)	0.027
$r_3(i)$– daily comsumption rate for cow's milk	Normal	From Annex 1. $(0.9*0.4)^{c}$	0.194 (3044)	1.606 (2779)	0.087

^{a} – Given value present mode for triangle type of distribution;

^{b} - μ and σ - mean and standard deviation, correspondingly, for logarithmically regenerated data having lognormal type of distribution;

^{c} - mean and standard deviation, correspondingly, for the data having normal type of distribution

Sensitivity indices of the parameters placed diminution order are presented in the table 28.3. Graphically obtained results are presented on Fig 28.1. from the table 28.3 and Fig 28.1 it is evident that two parameters make the highest effect to variability of thyroid exposure dose:

- thyroid veight;
- measured ^{131}I content in thyroid

Lognormal distribution assumed for thyroid weight in [1], has GSD=1.477. While increasing GSD value for measured ^{131}I content in thyroid over GSD value for thyroid weight, measured ^{131}I content in thyroid will make the highest effect to variability of thyroid exposure dose.

Table 28.3. Sensitivity indices.

Parameter	SI
M_{th}	0.783
$Q(t_m)$	0.732
$T_b(age)$	0.213
$E_{131,th}$	0.174
T_g	0.121
T_w	0.119
$TF_{c,m}$	0.092
$r_3(i)$	0.087
V_g	0.043
$T_{c,b}$	0.035
$r_2(i)$	0.027
$I_{g,c}$	0.012
$P(t)$	0.009

r_1	0.006
Y_g	0.005
w_{th}	0

Obtained results lead to the following conclusion:

- Both joint and Belarusian dosimetric models use the same approaches peculiar to radioecologic model. The difference is that in joint dosimetric model differential equations are used, and in Belarusian model the same but integral equations are used.
- Introducing of parameters suggested in joint dosimetric model increases thyroid exposure dose by 5% at average.
- Use of joint dosimetric model for thyroid dose calculation for the citizens of Belarus is possible considering thyroid weight correction corresponding to different age groups of Belarusian population.

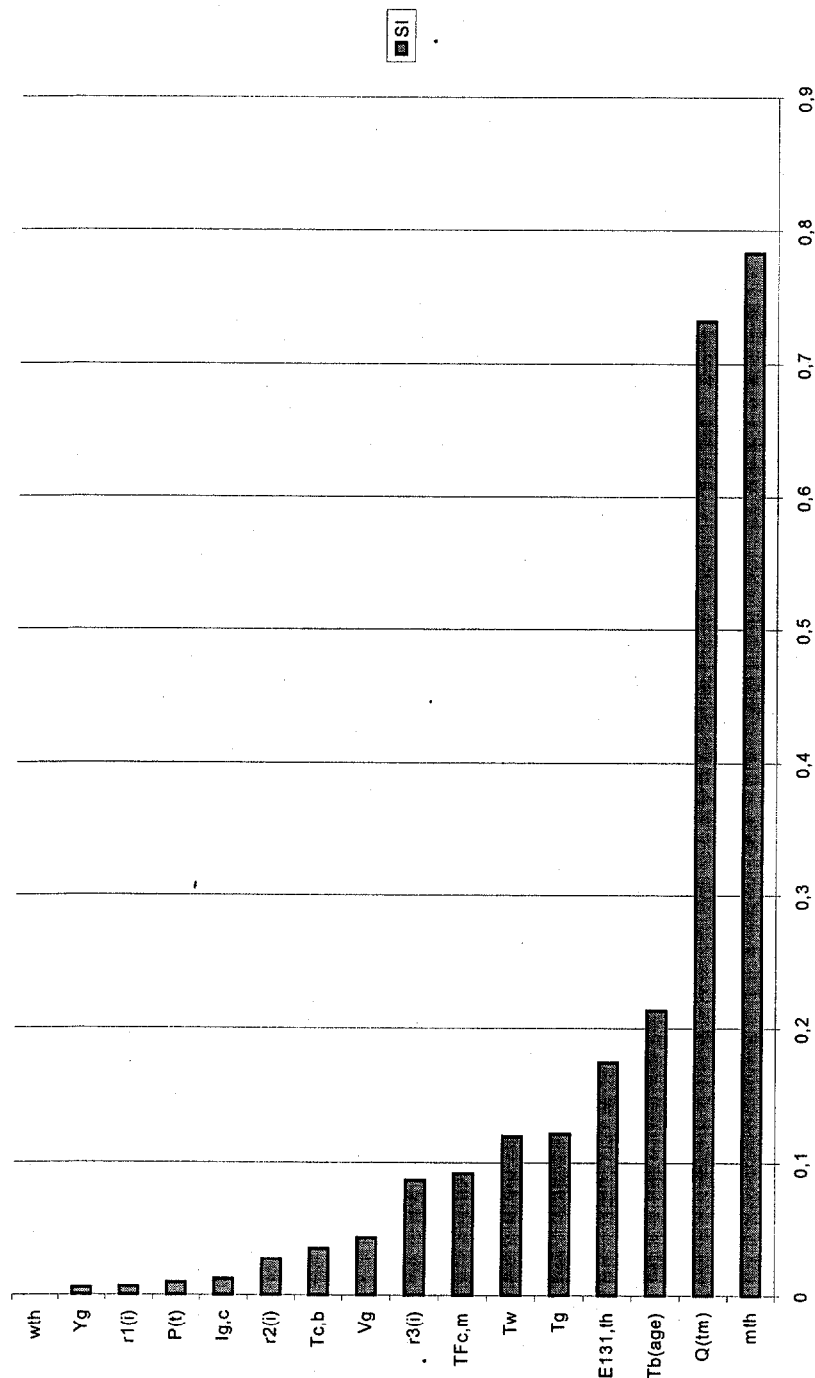SENCITIVITY INDEX FOR THE PARAMETERS OF THE JOINT DOSIMETRY MODEL

Fig 28.1. Sensitivity of dosimetric model to the parameters, suggested in [1].

Milestone 29: Continue entering initial dosimetric information to the dosimetry DB

Because of difficulties described in [6], the following information have been taken from the original notebooks including passport data:

1. Code of notebook.
2. Address (constant place of residence or place at the time of the accident):
   - raion;
   - settlement;
3. Surname.
4. First name.
5. Patronymic.
6. Date (year) of birth.
7. Occupation.
8. Readings of measurement of exposure dose rate over thyroid without subtraction of the background.
9. Units of measurement.
10. Readings of measurement of exposure dose rate over liver.
11. Results of background measurement indoor.
12. Results of background measurement outdoor.
13. Starting date of iodine prophylaxis and its duration.
14. Date of arrival to the place of measurement.
15. Date of leaving from the place of constant residence.
16. Comment.

All in all 3207 records have been entered to the data base. 946 records refer to children, 3073 – to adults, in 187 records date of birth is missed. Results of exposure dose rate over liver measurement – 446 records; results of indoor background measurement – 578 records, results of outdoor background measurement 66 records. Information concerning iodine prophylaxis and its duration, arrival date to the place of measurement, and date of leaving out from the place of constant residence is missed.

Number of records by the dates of measurements is presented in table 29.1.

Таблица 29.1. Number of measurements by the dates of measurements for the records entered to the DB.

Date of measurement	Number of measurements
19.05.86	293
20.05.86	376
23.05.86	25
26.05.86	487
27.05.86	342
28.05.86	844
29.05.86	363
30.05.86	251
01.07.86	225

While linking thyroid file presented by the Institute of Biophysics and above mentioned table 1662 records have been matched through the following items:

1. Address (raion, settlement).
2. Family name (codes of family names), initials.
3. Date of birth.

As far as names of raions and settlements while entering the information into the DB were taken from the lists identical for both files errors in entering addresses were excluded. To minimize the number of mistakes while entering family names, the last could also be taken from the list. Besides, linkage of files first was made by complete family name and then by code of family name (excluding vowels and considering one letter misspelling). Therefore, errors while reading and entering family names were minimized. That is why one should consider that the majority of not matched records had not been entered to the thyroid file.

Problems encountered while data entry. Rather often we faced with situation when it was unclear which information was original. So, for example, on the coversheet of the notebook №10 (Kostiukovichi raion, village Samotevichi) it is written: "Samotevichi. Measurement of radiation in population, June 1986." And below an instruction is added (presumably written by Y.I. Gavrilin): "Date of measurement − 30.05.86".

In the notebook №5 (Potchepov rural medical and obstetric station, village Trubil'na) there is a record (likely made later): "Subtract background − 300". In the same notebook, for measurements №36 and №50 values of 228 and 220 are deleted and changed to the value of 300.

For the villages Deriazhna and Krasnitsa there are several notebooks with the results of measurements. For some group of individuals there are at least 2 records in different notebooks for one date with different readings of measurement.

For example, in the notebook №14 there is a record №67:
_ , year of birth - 1985, date of measurement: 19.05.86, reading of mea urement - 0,04.

In the notebook №1 there is a record №13:
, 1,5 months, Date of measurement: 19.05.86, reading of measurement - 0.720, readings in the second column: 0.3.

The following record is entered to the data base:
., 1985,19.05.86, 0.3.

In the notebook №14 there is a record №107:
., year of birth: 1946, secretary, date of measurement: 19.05.86, readings: 0,25.

In the notebook №1 there is a record №28:
.., secretary, date of measurement: 19.05.86, readings: 1.200, readings in the second column: 0.64.

The following record is entered to the data base:
1946,19.05.86, 0.64.

In the notebook №14 there is a record №114 :
, year of birth: 1986., Date of measurement: 19.05.86, readings: 0,05.

In the notebook №1 there is a record №123:
.,2 months, Date of measurement 19.05.86, readings: 0.560, readings in the second column: 0.14.

The following record is entered to the data base:
., 1986,19.05.86, 0.14.

We think that the information from the original notebooks should be entered to the DB in the format it is presented in the notebooks. All calculations and estimations should be registered in additional files of DB attached to the file of original information.

Milestone 30: Model using Monte-Carlo method the effect of human surface contamination to DP-5 readings.

Activity performed in the 3-rd quarter was a step in calculation of detector response to gamma-radiation sources distributed over human surface. In particular, basing on assumption made by Y.I. Gavrilin, surface of mathematical phantoms was divided into 17 areas which then considered as independent sources (Figure and Table 30.1)
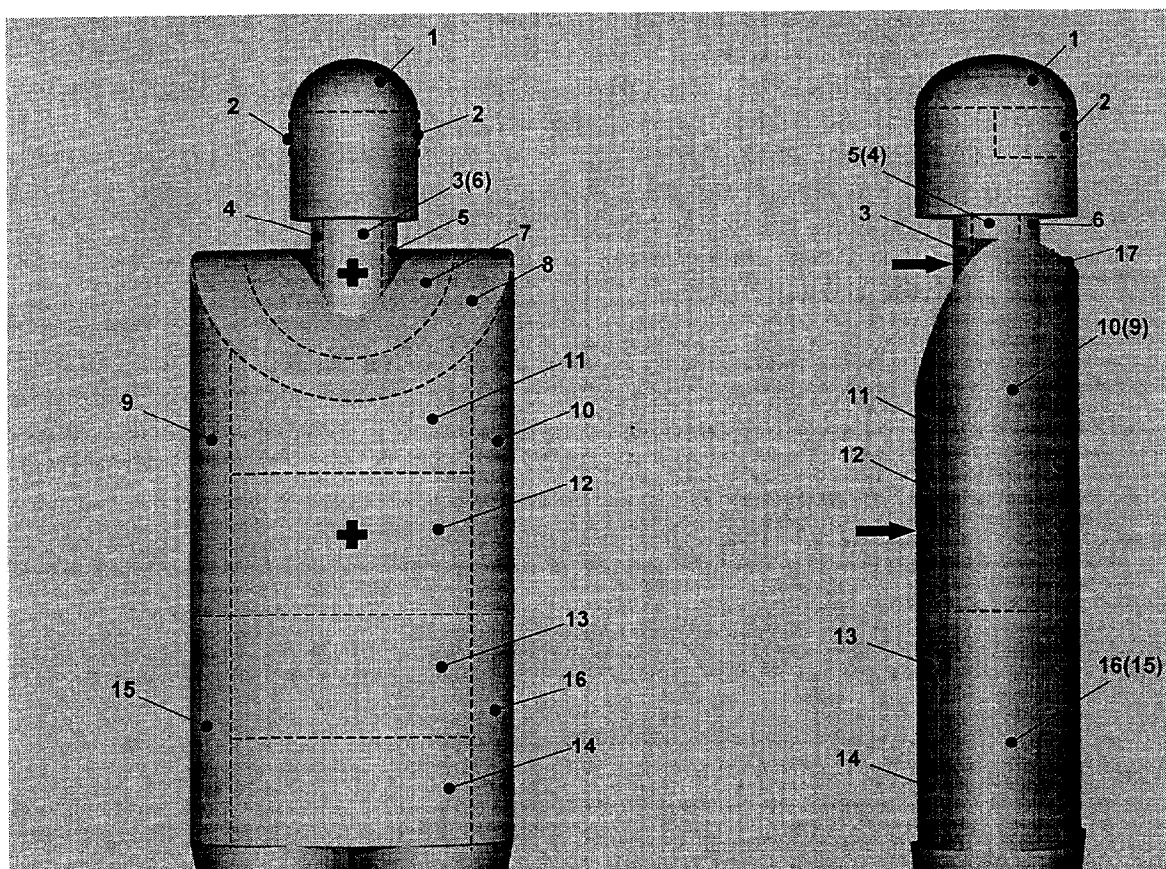
Figure 30.1. Division of phantom surface into surface sources (## of invisible areas are given in brackets. Arrows and daggers show location of the detector opposite thyroid and tightly to the body (background measurements)).

Table. 30.1

Description of surface sources for mathematical phantoms of human body.

№	Description	Type of surface*)
1	Hair: upper part of head	ELL
2	Hair: rear part of head	REC
3	Neck: front quadrant	RCC
4	Neck: right quadrant	RCC
5	Neck: left quadrant	RCC
6	Neck: rear quadrant	RCC
7	Upper part of thorax and shoulders	PAR
8	Upper part of thorax and shoulders	PAR
9	Upper part of right hand	REC
10	Upper part of left hand	REC
11	Front part of body	REC
12	Front part of body	REC
13	Front part of body	REC
14	Front part of body	REC
15	Right forearm	REC
16	Left forearm	REC
17	Shoulders (rear side)	PAR

*) ELL – ellipsoid, REC – straight elliptic cylinder; RCC – straight circular cylinder; PAR – parabolic plate.

For above described areas-sources, values of area were calculated. Area calculation was performed analytically (when it was possible) and through Monte-Carlo method (for all areas). Table 30.2 presents values of area for all areas of six standard mathematical phantoms.

Table. 30.2

Area values for area-sources at the surface of mathematical phantoms of human body, cm^2.

№ source	age, years				
	20	15	10	5	1
1	436.54	412.48	378.33	348.82	258.78
2	277.59	255.88	232.38	204.68	156.94
3	95.33	82.49	47.61	30.07	22.23
4, 5	46.55	41.49	22.53	13.97	9.02
6	29.85	26.73	13.93	8.39	4.91
7	263.35	206.92	130.75	89.24	54.27
8	405.19	318.32	196.95	133.49	75.05
9, 10	660.95	562.54	373.74	260.10	165.08
15, 16	210.30	178.42	121.00	85.00	53.97
11	555.24	436.47	· 291.50	194.89	115.68
12, 13, 14	467.89	368.02	240.32	160.54	94.43
17	175.57	147.85	100.37	75.53	45.90

Under assigned area source coordinates are performed in a way that distribution of sources were equal through the area of surface. MCNP program having wide features in performing source parameters, can not provide with a mechanism allowing to solve given task for described above types of surface. That is why (as it was mentioned earlier) parameters of source are performed by subprogram SOURCE, which should be presented by user. Development of given program called for:
1) work out and test algorithm of coordinates perform;
2) calculate tables of distributions;
3) develop and test subprogram;
4) introduce subprogram into MCNP program and test obtained executable file

All enlisted above tasks have been successfully solved. At present dosimetry group make calculations of detector's response in 5 locations towards the phantom, for 14 areas of sources (because of symmetry tasks for areas 5,10 and 15 are not considered), 13 values of gamma-quantum energy. A detector of SRP-68-01 radiometer is considered.

In conclusion it should be noted that the peculiar feature of the task under solution is lack of experimental data on detector's response to surface sources located on the human body. As far as calculation of detector's characteristics is done "blindly", particular attention should be paid to quality assurance. First of all it concerns the procedures of checkout, testing, doubling of outcomes etc. As a result labour-intensivness will grow significantly

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5. Hoffman F.O., Gardner R.H. Evaluation of uncertainties in radiological model assessment models // Radiological assessment. A textbook on environmental dose analysis / U.S. Nuclear Regulatory Commission, NUREG/CR-3332. - Washington D.C., 1983. – P. 11-1 – 11-45.
6. Milestone 29. Report for the 2-nd quarter, 2000.

Table 1. 5 scenarios for the second intercomparison of the results for the estimation of ^{131}I concentration in thyroid and thyroid exposure doses performed by the teams of Belarusian, Ukrainian, and Russian dosimetrists.

Information Category	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5
Date of birth	31 Aug 81	15 Oct 85	1 May 84	20 Apr 74	23 Jan 77
Place of residence	Conaminated village	Conaminated village	Conaminated village	Conaminated village	Conaminated village
Date of measurement with SRP	28 May	8 May	17 May	23 May	12 May
Measured exposure rates (μR/h)					
Thyroid	930	590	190	2190	1840
Abdomen	No Data	No Data	No Data	No Data	No Data
Room background	No Data	No Data	No Data	No Data	No Data
Subject washed before counting?	Don't know	Don't know	Don't know	Don't know	Don't know
Respondent to questions	Mother	Sister	Mother	Grandmother	Mother
Milk consumption rate (L/d)?	0.9	0.3	0.5	1.8	1.3
Milk source(s)?	Family cow	Family cow	Family cow	Family cow	Family cow
Change in milk consumption rate?	No	Yes	Yes	No	No
Date		5 May	10 May		
New rate (L/d)		0	0		
Date					
New rate (L/d)					
Took stable iodine tablets?	Yes	No	Yes	No	No
Start date	8 May		10 May		
End date	10 May		12 May		
Start date					
End date					

Leafy vegetable consumption?	Yes	No	No	Yes	Yes
Rate (kg/d)	0.017	0	0	0.043	0.033
Change in leafy vegetable consumption rate?	No	No	No	No	No
Date					
New rate (kg/d)					
Date					
New rate (kg/d)					
Was subject relocated?	No	No	No	No	No
When					
Where					
		Does not know			
Date dairy animals on pasture in area?	30 April	28 Apr—2 May	26 April	20 April	28 April
		is estimated range			
Date(s) of I-131 deposition	Amount (kBq/m2)	Amount (kBq/m2)	Amount (kBq/m2)	Amount (kBq/m2)	Amount (kBq/m2)
26 April	-	-	-	-	-
27 April	2000	-	1200	-	200
28 April	3000	500	-	800	800
29 April	1000	1200	-	1700	300
30 April	-	200	-	900	-
GOALS OF THE ANALYSIS					
PART A:					
Reference Date:	28 May	8 May	17 May	23 May	12 May
1. Estimate thyroid activity (kBq) on the reference date					
2. Estimate the uncertainty in thyroid activity					
PART B:					
Assuming content on reference date is:	100 kBq	100 kBq	100 kBq	100 kBq	100 kBq
3. Estimate thyroid dose (mGy) for scenario					
4. Estimate the uncertainty in thyroid dose					